



CIBSE **JOURNAL**

**LETI'S NEXT STEPS
ON ZERO CARBON
GETTING TO GRIPS
WITH THE BMS
BATTERY STORAGE
COST MODEL**

#Build2Perform

March 2019

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Global reform

Following reviews of construction in high-rise residential buildings, the construction sector is facing major change with calls for a significant update of regulations. Hywel Davies reports

In response to the outcry over failings in tall buildings, government is set to introduce a Building Commissioner with responsibility for auditing workers in the industry. There will be greater protection for homeowners and owners' organisations, to help them obtain compensation if builders or engineers have been negligent. The response has been described as the 'biggest shake-up in building and construction laws in our... history.'

An independent report found that the 'nature and extent of the problems [in the industry] are significant and concerning', and 'likely to undermine public trust in the health and safety of buildings if they are not addressed in a comprehensive manner'.

It calls for registration schemes for builders, surveyors, architects, engineers, designers, and building inspectors – and new mechanisms for training and licensing. The government proposals are intended to ensure that 'people who work in the building and construction industry' will have 'to take responsibility for their work.'

The proposals are likely to mean 'requiring designers to sign off on their designs, and builders to build their buildings in line with those designs.' The proposed commissioner would have responsibility for enforcing the licensing scheme.

Other measures will give builders less control over the certifiers responsible for approving their work, and a bond defects scheme will make it easier for homeowners to remedy defective work.

The proposals are part of the state government of New South Wales' response to a major review commissioned in August 2017 – and published in April 2018 – by the Building Ministers' Forum, a collective of Australian state and territory ministers. Its report was the culmination of six months' investigation by the chancellor of Western Sydney University, Peter Shergold, and lawyer Bronwyn Weir, who has many years' experience of building regulations. Further responses will be delivered across Australia in the coming weeks.

The report was commissioned in reaction to a series of problems with tall residential buildings in Australia, including a fire in the Lacrosse Building in Melbourne. Since it was published, there have been highly publicised structural failures in the 36-storey Opal Tower, at Sydney



"Issues facing engineers and their associations across the world are very similar"

Olympic Park. Significant cracks that developed in December 2018 have been attributed to design and construction failures. In early February, there was another high-rise fire in Melbourne, in a block of flats in Spencer Street.

Six days later, NSW fair trading minister Matt Kean released his response to the Shergold Weir report into compliance and enforcement in the Australian building industry. 'When you buy a property in NSW, you have every right to expect that [it] is safe, structurally sound, and free from major defects. And, unfortunately, that is not always the case,' said Kean.

He announced the state government would accept the 'vast majority' of the 24 recommendations in the Shergold Weir report, published just three weeks before *Building a Safer Future*, Dame Judith Hackitt's review of building regulations and fire safety in England.

The two reports review building regulations in their respective countries and recommend reform. They are quite different, reflecting their respective terms of reference and context, and considerable

differences between building regulations in the eight Australian jurisdictions and in England. However, the reports' observations on building practices, culture and regulatory oversight are remarkably similar, and there is scope to learn from each other. Similarities include:



Sydney buildings

Support for performance/outcomes-based building standards. Both reports conclude that standards for building construction must allow innovation and use of new and emerging products and building methods. They also acknowledge that a performance- or outcomes-based model requires high levels of competency and transparency, which are lacking in current practices.

Architects and designers should be obliged to produce designs that show a proposed building will meet required safety standards. They should supply full evidence that relevant safety considerations have been addressed and managed, and that the building will comply with all relevant legislative requirements.

The role of building surveyors or control officers in both jurisdictions, and the need to avoid conflicts of interest and clients choosing their enforcement officials. Australia has four models across its eight jurisdictions but, where owners or builders can engage a private surveyor or local government to issue approvals, the process to be followed is essentially the same. There are similarities between Dame Judith's model and those in Western Australia, South Australia and, to some extent, Tasmania.

Greater control over changes to approved designs. In particular, over changes to design in 'design and construction' models and during 'value engineering', with tighter control and full records of changes, which need to be enforced effectively. Linked to this is the need for:

Record keeping using digital records, to deliver and maintain key building design and safety information using new and emerging technologies (such as BIM) to give owners and safety managers access to all relevant information for the life of the building.

Competency of building practitioners, with both reports recommending improved competency of key practitioners so that performance/outcomes-based design and construction is delivered by those who demonstrate and evidence adequate qualifications and skills. The Shergold Weir report recommends a harmonised registration scheme for all eight Australian jurisdictions and compulsory professional development.

Comprehensive regulatory enforcement powers supported by meaningful penalties, to reward a compliance-based culture, with high-level coordination of relevant regulators – the 'joint competent authority' in Dame Judith's scheme.

Both reports also address the role of fire authorities, maintenance of fire-safety systems during occupation, and building product safety and quality assurance.

The issues facing governments across the world, as well as professional engineers, are very similar as they strive to rebuild trust and confidence in their building and construction sectors. CIBSE is a global engineering body with members in the UK and Australia, so there is plenty of scope to work together to respond to the challenges our sector faces. While the exact destination may vary from state to state, the direction of travel is clear: regulatory change is coming, and we need to embrace it.



Shaping a low carbon future, together

Work by the government on Building Regulations and the future of heat offers many opportunities to be involved with CIBSE activities, says the Institution's Julie Godefroy

In the past 10 years, the UK has achieved significant carbon savings through the decarbonisation of the electricity grid. Decarbonising heat is now acknowledged as one of the biggest challenges if the UK is to continue on its trajectory and meet its carbon-reduction targets.

The Department for Business, Energy and Industrial Strategy (BEIS) is exploring how this may happen, and has published its analysis of technology and policy options.

Much aligns with recommendations by CIBSE and others: there is currently no clear, single contender to replace the wide coverage and convenience of gas heating, and a low carbon heating future is likely to require a mix of options. These include electric heating (with a large role for heat pumps); hydrogen, whether used in fuel cells or for decarbonising the gas grid; and heat networks, particularly in dense and mixed-use areas, where they can take advantage of alternative fuel sources and heat rejection from cooling systems, the Tube or other processes.

BEIS also seems to have acknowledged that the market alone cannot deliver such substantial changes, capital investments



"Buildings that are not connected to the gas grid are likely to be the early test beds of future low carbon heat options"

and infrastructure upgrades, while still keeping energy affordable and protecting consumers: a mix of policy requirements and incentives will be required. The department also stresses the importance of increasing consumer awareness. While this is true, there are probably other key drivers that have more of an influence on the heating choices made by consumers. These include convenience, affordability, advice from suppliers and overcoming the caution of installers towards new products. New regulations will be needed to provide the catalyst.

Buildings that are not connected to the gas grid are likely to be the early test beds of future low carbon heat options – an approach CIBSE has long advocated.

The Institution will continue to develop guidance in this area, in particular for future heat networks (4th and 5th generation and ambient loops), electric heating, and demand management. Get in touch if you are interested in taking part.

Beyond questions of how to meet demand, CIBSE has repeatedly stressed that we must consider energy efficiency, both to deliver carbon savings and to increase the feasibility of low-carbon

supply options. Simply put, without demand reduction it is unlikely we will have enough capacity to supply heat entirely from low carbon sources, particularly when huge increases in electricity demand are expected in the transport sector from electric vehicles.

Collaboration on Building Regulations – CIBSE and the UK Green Building Council

After our detailed position paper on recommendations for changes to Building Regulations Part L and F, CIBSE has worked with the UK Green Building Council to produce a common summary statement. The aim of this is to send a consistent message to government and influence the upcoming review of these parts of the Building Regulations. Key elements include:

- Establishing a clear trajectory to 'zero carbon', so the industry can start adopting stretching targets and developing cost-effective solutions
 - Exploring how to gradually introduce requirements on operational energy and carbon, rather than design and as-built requirements alone. As a very first step, this should start with gathering data on operational performance
 - Better addressing indoor air quality and overheating.
- Both papers can be found at bit.ly/CJMar19pos

Environmental regulations

CIBSE has responded to consultations on environmental regulations – an area likely to be most affected by Brexit:

- Department for Environment, Food and Rural Affairs consultation on monitoring of environmental indicators: we broadly support this, and have advocated a more robust framework, including a better culture of assessing policy effectiveness, and reporting against science-based objectives (for example World Health Organization air quality guidelines), not just against the government's own targets
- Parliamentary inquiry on the Environment Bill, which sets the framework for environmental regulations and enforcement post-Brexit: we support a number of proposals; however, we also have serious concerns, including the independence of the future body that will hold government to account.

Current consultations:

- Air pollution control programme: respond to CIBSE by 4 March
 - We are working with the Royal Academy of Engineering to inform the UK's post-Brexit immigration strategy. Let us know if you would like to inform our work – for example, if you have assessed how skills and/or salary criteria may affect your business.
- All can be found at cibse.org/news-and-policy/consultations

The Trent Basin housing development in Nottingham has communal battery storage

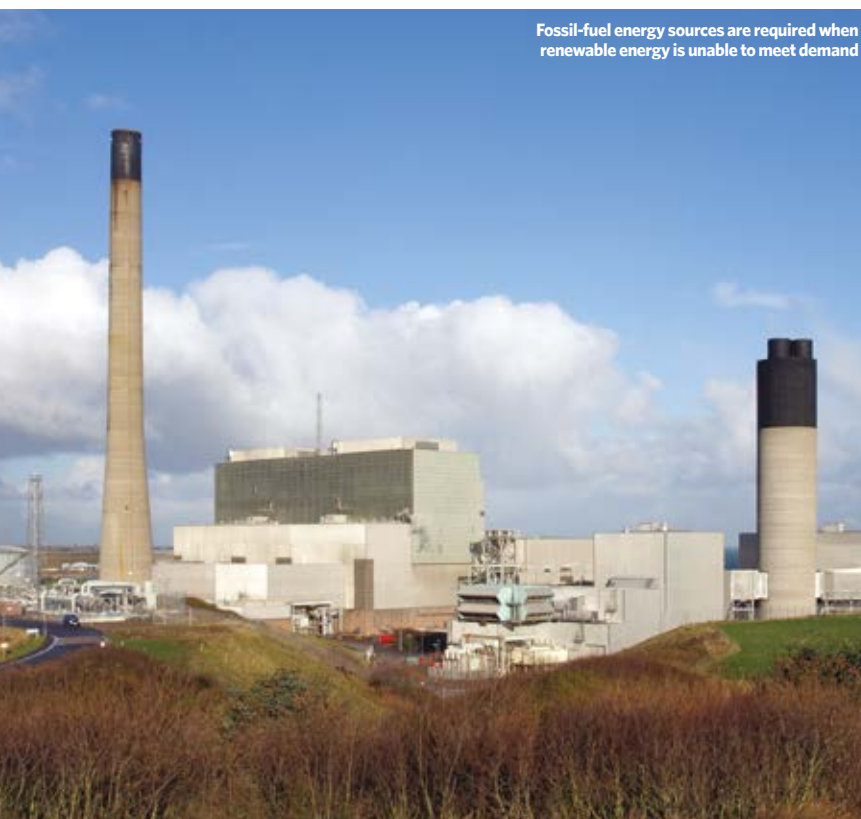


JULIE GODEFROY
is technical manager
at CIBSE



Worth Another Look...
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Fossil-fuel energy sources are required when renewable energy is unable to meet demand

The issues of polluting neighbours and carbon factor calculations

A different approach

I read the opinion article by Mike Hefford ('Other factors', *CIBSE Journal*, February 2019) with interest, and certainly agree with his call for wider decentralisation of power generation using CHP integrated with other low carbon technologies.

However, I cannot agree with his endorsement of the use of averages for grid carbon value, be it over a month, year or any other period. This is because focusing on average carbon content disguises the high carbon content of the dispatchable power being used every day to 'top up' low carbon sources, such as wind and solar.

To clarify, dispatchable sources of electricity are those that can be dispatched at the request of power-grid operators and used on demand when renewable energy sources are unable to meet demand. Dispatchable power also provides our 'insurance' against the lights going out when the wind isn't blowing and the sun is obscured by cloud.

The fact that so much of our renewable capacity is at the mercy of the vagaries of the weather means we will always need this dispatchable capacity, irrespective of the installed renewable capacity. In fact, increased use of electrical/electronic technologies, electric cars, heat pumps and so on will increase the UK's power demands in coming years, which increases the backup capacity requirement.

The energy source of this dispatchable power is known as the marginal energy source. Even with the significant increases we've seen in renewable capacity over the past few years, that marginal energy source is still predominantly inefficient, gas-fired power stations, with a little coal thrown in when demand is high. So I believe it is this marginal carbon factor that we should be focusing on, rather than an average carbon factor from all power sources (wind, solar, nuclear, gas, coal).

Moreover, I would argue that focusing on the dispatchable marginal carbon factor, rather than the average carbon factor, is the only way we can effectively resolve the UK's energy trilemma – namely, the need to simultaneously reduce carbon emissions, cut energy costs and ensure security of supply.

Focusing on the marginal energy source reinforces our continued dependence on gas and, crucially, the imperative to use that gas more wisely and efficiently. Such a focus naturally leads us to wider use of 'prosumer' buildings that produce and consume energy. Typically, these would use decentralised CHP combined with heat pumps and electric boilers, in a smart system that can avail itself of green grid electricity when appropriate.

As well as taking pressure off the grid and making more efficient use of fossil-fuel energy sources, decentralising a higher proportion of our dispatchable power meets all of the requirements of the energy trilemma. This approach also has implications for the proposed SAP 10, in terms of using a more realistic carbon factor based on marginal energy sources. In parallel, there is a need to enhance the functionality of SAP software to facilitate the use of the mixed hybrid systems described above, which are not supported in the current version of SAP.

The fact that the Department for Business, Energy and Industrial Strategy is now reconsidering the lower carbon factor proposed in the draft SAP 10 is clearly to be welcomed.

Lars Fabricius
Managing director, SAV Systems

Hard to breathe

I was very interested in the article regarding wood burning. I suffer first hand from a neighbour's chimney that manages to engulf our house in smoke that eventually enters through window and underfloor vents. Apart from the disgusting smell, I am now wondering if we are breathing in any 'nasties'.

I appreciate there is nothing we can do to stop the burning, but I am enquiring of your readers to see if they have had similar experiences – and would welcome any advice.

Colin Smith, ACIBSE

CIBSE Journal welcomes readers' letters, opinions, news stories, events listings, and proposals for articles. Please send all material for possible publication to: editor@cibsejournal.com or write to: Alex Smith, editor, CIBSE Journal, CPL, 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB, UK. We reserve the right to edit all letters.

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Cui, Jia Michelle Nottingham, United Kingdom
Choi, Hin Fai Raymond Tin Shui Wai, Hong Kong
Owen, Jeremy David Nottingham, United Kingdom
Chan, Chun Keung Bauhinia Garden, Hong Kong
McSoley, Paul James Stanford-le-Hope, United Kingdom
Malhotra, Sarvesh Maidenhead, United Kingdom
Smith, Carl Langdon Hills, United Kingdom
Sreekeessoon, Tarun New Grove, Mauritius
Williams, Michael Jon Brighton, United Kingdom
Chan, Wai Kit Tsuen Wan, Hong Kong
Jankowski, Slawomir Glasgow, United Kingdom
Mavridis, Lazaros London, United Kingdom
Chen, Tianqi Shanghai, China

Gilmour-White, William Graham Honiton, United Kingdom
Glensman, Kate London, United Kingdom
Jones, Lyudmila St Albans, United Kingdom
Lau, Alfred Wui Chun Hong Kong, Hong Kong
Marchisotta, Antonio London, United Kingdom
Mujtuba, Anzar Brentwood, United Kingdom
Bowman, Geoffrey David Rochester, United Kingdom
Alo, Babafunsho Milton Keynes, United Kingdom
Rabadia, Raj London, United Kingdom
ASSOCIATE
Hall, Andrew Beckenham, United Kingdom
Fox, Christopher Daniel Mold, United Kingdom
Hickman, Mark Birmingham, United Kingdom
Catchpole, Mark Dartford, United Kingdom
Bull, Paul James Cardiff, United Kingdom
Jones, Nathan Loughton, United Kingdom
Woodhead, Adrian Huddersfield, United Kingdom
Watson, David Matthew Leeds, United Kingdom
Muralidharan, Vishnu Haywards Heath, United Kingdom
Coldrey, Tom Exeter, United Kingdom
Sapina-Grau, Antoni London, United Kingdom
Keen, George Welling, United Kingdom
Ogunlade, Daniel Dulwich, United Kingdom
Atkins, Christopher Bicester, United Kingdom
Wilkinson, Ross Alan Welwyn Garden City, United Kingdom
Headley, Luke Warwickshire, United Kingdom
Ruiz Blanco, David Felix Manchester, United Kingdom
LICENTIATE
Finestone, Harry London, United Kingdom
Reilly, Ronan London, United Kingdom
Sanjeev, Jeyatharsine Cheshunt, United Kingdom
Wheeler, Chris Manchester, United Kingdom
Pool, James Bristol, United Kingdom
Coyle, Kieron William Cardiff, United Kingdom
Jayes, Lauryn Nottingham, United Kingdom
Mulvanny, Sara Manchester, United Kingdom
Natarajan Theyagarajan, Nitharshan London, United Kingdom
Yehezkel, Rachel Leeds, United Kingdom
Leary, James Guildford, United Kingdom
Brown, Michael Allan Dunmow, United Kingdom
Anton-Barro, Miguel Stratford-Upon-Avon, United Kingdom

“Insanity is doing the same thing over and over again and expecting different results.”
– Einstein



Global reform

Following reviews of construction in high-rise residential buildings, the construction sector is facing major change with calls for a significant update of regulations. Hywel Davies reports

In response to the outcry over failings in tall buildings, government is set to introduce a Building Commissioner with responsibility for auditing workers in the industry. There will be greater protection for homeowners and owners' organisations, to help them obtain compensation if builders or engineers have been negligent. The response has been described as the 'biggest shake-up in building and construction laws in our... history.'

An independent report found that the 'nature and extent of the problems [in the industry] are significant and concerning', and 'likely to undermine public trust in the health and safety of buildings if they are not addressed in a comprehensive manner'.

It calls for registration schemes for builders, surveyors, architects, engineers, designers, and building inspectors – and new mechanisms for training and licensing. The government proposals are intended to ensure that 'people who work in the building and construction industry' will have 'to take responsibility for their work.'

The proposals are likely to mean 'requiring designers to sign off on their designs, and builders to build their buildings in line with those designs.' The proposed commissioner would have responsibility for enforcing the licensing scheme.

Other measures will give builders less control over the certifiers responsible for approving their work, and a bond defects scheme will make it easier for homeowners to remedy defective work.

The proposals are part of the state government of New South Wales' response to a major review commissioned in August 2017 – and published in April 2018 – by the Building Ministers' Forum, a collective of Australian state and territory ministers. Its report was the culmination of six months' investigation by the chancellor of Western Sydney University, Peter Shergold, and lawyer Bronwyn Weir, who has many years' experience of building regulations. Further responses will be delivered across Australia in the coming weeks.

The report was commissioned in reaction to a series of problems with tall residential buildings in Australia, including a fire in the Lacrosse Building in Melbourne. Since it was published, there have been highly publicised structural failures in the 36-storey Opal Tower, at Sydney



"Issues facing engineers and their associations across the world are very similar"

Olympic Park. Significant cracks that developed in December 2018 have been attributed to design and construction failures. In early February, there was another high-rise fire in Melbourne, in a block of flats in Spencer Street.

Six days later, NSW fair trading minister Matt Kean released his response to the Shergold Weir report into compliance and enforcement in the Australian building industry. 'When you buy a property in NSW, you have every right to expect that [it] is safe, structurally sound, and free from major defects. And, unfortunately, that is not always the case,' said Kean.

He announced the state government would accept the 'vast majority' of the 24 recommendations in the Shergold Weir report, published just three weeks before *Building a Safer Future*, Dame Judith Hackitt's review of building regulations and fire safety in England.

The two reports review building regulations in their respective countries and recommend reform. They are quite different, reflecting their respective terms of reference and context, and considerable

differences between building regulations in the eight Australian jurisdictions and in England. However, the reports' observations on building practices, culture and regulatory oversight are remarkably similar, and there is scope to learn from each other. Similarities include:



Support for performance/outcomes-based building standards. Both reports conclude that standards for building construction must allow innovation and use of new and emerging products and building methods. They also acknowledge that a performance- or outcomes-based model requires high levels of competency and transparency, which are lacking in current practices.

Architects and designers should be obliged to produce designs that show a proposed building will meet required safety standards. They should supply full evidence that relevant safety considerations have been addressed and managed, and that the building will comply with all relevant legislative requirements.

The role of building surveyors or control officers in both jurisdictions, and the need to avoid conflicts of interest and clients choosing their enforcement officials. Australia has four models across its eight jurisdictions but, where owners or builders can engage a private surveyor or local government to issue approvals, the process to be followed is essentially the same. There are similarities between Dame Judith's model and those in Western Australia, South Australia and, to some extent, Tasmania.

Greater control over changes to approved designs. In particular, over changes to design in 'design and construction' models and during 'value engineering', with tighter control and full records of changes, which need to be enforced effectively. Linked to this is the need for:

Record keeping using digital records, to deliver and maintain key building design and safety information using new and emerging technologies (such as BIM) to give owners and safety managers access to all relevant information for the life of the building.

Competency of building practitioners, with both reports recommending improved competency of key practitioners so that performance/outcomes-based design and construction is delivered by those who demonstrate and evidence adequate qualifications and skills. The Shergold Weir report recommends a harmonised registration scheme for all eight Australian jurisdictions and compulsory professional development.

Comprehensive regulatory enforcement powers supported by meaningful penalties, to reward a compliance-based culture, with high-level coordination of relevant regulators – the 'joint competent authority' in Dame Judith's scheme.

Both reports also address the role of fire authorities, maintenance of fire-safety systems during occupation, and building product safety and quality assurance.

The issues facing governments across the world, as well as professional engineers, are very similar as they strive to rebuild trust and confidence in their building and construction sectors. CIBSE is a global engineering body with members in the UK and Australia, so there is plenty of scope to work together to respond to the challenges our sector faces. While the exact destination may vary from state to state, the direction of travel is clear: regulatory change is coming, and we need to embrace it.

"If you always do what you've always done, you'll always get what you've always got."

– Ford

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Shaping a low carbon future, together

Work by the government on Building Regulations and the future of heat offers many opportunities to be involved with CIBSE activities, says the Institution's Julie Godefroy

In the past 10 years, the UK has achieved significant carbon savings through the decarbonisation of the electricity grid. Decarbonising heat is now acknowledged as one of the biggest challenges if the UK is to continue on its trajectory and meet its carbon-reduction targets.

The Department for Business, Energy and Industrial Strategy (BEIS) is exploring how this may happen, and has published its analysis of technology and policy options.

Much aligns with recommendations by CIBSE and others: there is currently no clear, single contender to replace the wide coverage and convenience of gas heating, and a low carbon heating future is likely to require a mix of options. These include electric heating (with a large role for heat pumps); hydrogen, whether used in fuel cells or for decarbonising the gas grid; and heat networks, particularly in dense and mixed-use areas, where they can take advantage of alternative fuel sources and heat rejection from cooling systems, the Tube or other processes.

BEIS also seems to have acknowledged that the market alone cannot deliver such substantial changes, capital investments



"Buildings that are not connected to the gas grid are likely to be the early test beds of future low carbon heat options"

and infrastructure upgrades, while still keeping energy affordable and protecting consumers: a mix of policy requirements and incentives will be required. The department also stresses the importance of increasing consumer awareness. While this is true, there are probably other key drivers that have more of an influence on the heating choices made by consumers. These include convenience, affordability, advice from suppliers and overcoming the caution of installers towards new products. New regulations will be needed to provide the catalyst.

Buildings that are not connected to the gas grid are likely to be the early test beds of future low carbon heat options – an approach CIBSE has long advocated.

The Institution will continue to develop guidance in this area, in particular for future heat networks (4th and 5th generation and ambient loops), electric heating, and demand management. Get in touch if you are interested in taking part.

Beyond questions of how to meet demand, CIBSE has repeatedly stressed that we must consider energy efficiency, both to deliver carbon savings and to increase the feasibility of low-carbon

supply options. Simply put, without demand reduction it is unlikely we will have enough capacity to supply heat entirely from low carbon sources, particularly when huge increases in electricity demand are expected in the transport sector from electric vehicles.

Collaboration on Building Regulations – CIBSE and the UK Green Building Council

After our detailed position paper on recommendations for changes to Building Regulations Part L and F, CIBSE has worked with the UK Green Building Council to produce a common summary statement. The aim of this is to send a consistent message to government and influence the upcoming review of these parts of the Building Regulations. Key elements include:

- Establishing a clear trajectory to 'zero carbon', so the industry can start adopting stretching targets and developing cost-effective solutions
 - Exploring how to gradually introduce requirements on operational energy and carbon, rather than design and as-built requirements alone. As a very first step, this should start with gathering data on operational performance
 - Better addressing indoor air quality and overheating.
- Both papers can be found at bit.ly/CJMar19pos

Environmental regulations

CIBSE has responded to consultations on environmental regulations – an area likely to be most affected by Brexit:

- Department for Environment, Food and Rural Affairs consultation on monitoring of environmental indicators: we broadly support this, and have advocated a more robust framework, including a better culture of assessing policy effectiveness, and reporting against science-based objectives (for example World Health Organization air quality guidelines), not just against the government's own targets
- Parliamentary inquiry on the Environment Bill, which sets the framework for environmental regulations and enforcement post-Brexit: we support a number of proposals; however, we also have serious concerns, including the independence of the future body that will hold government to account.

Current consultations:

- Air pollution control programme: respond to CIBSE by 4 March
 - We are working with the Royal Academy of Engineering to inform the UK's post-Brexit immigration strategy. Let us know if you would like to inform our work – for example, if you have assessed how skills and/or salary criteria may affect your business.
- All can be found at cibse.org/news-and-policy/consultations

The Trent Basin housing development in Nottingham has communal battery storage



JULIE GODEFROY
is technical manager
at CIBSE



**"If not us, who?
If not now, when?"**

– JFK

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**Building Performance Consultancy
(up to 100 employees)**

Winner: WARM: Low Energy Building Practice

Practising what it preaches, building performance consultancy WARM refurbished its offices to the Passivhaus standard. WARM wants to make this level of building performance and quality the standard in the UK, and the judges acknowledged how the consultancy is seeking to develop Passivhaus with the supply chain in an innovative way that is more likely to deliver longer-term impact.

Sponsored by Panasonic



**Building Performance Consultancy
(over 1,000 employees)**

Winner: BuroHappold Engineering

The judges commended the group's commitment to addressing building performance and ensuring that understanding is reflected in what is delivered on site. They acknowledged how BuroHappold is engaging with the key topics of healthy, safe buildings, and delivering ones that are resilient to a changing climate and that have less negative impact on the environment in the future.

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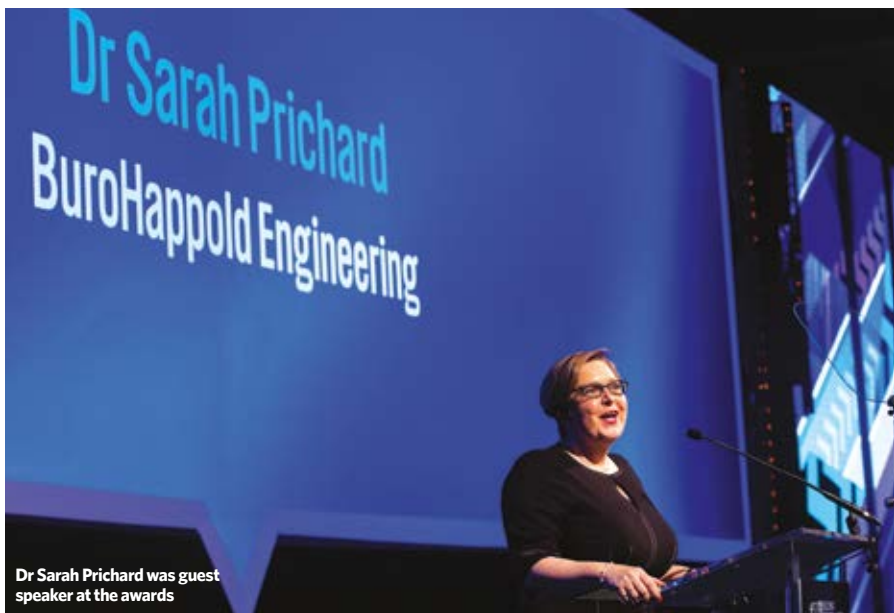


**Building Performance Consultancy
(101-1,000 employees)**

Winner: Cundall

The judges described Cundall's submission as comprehensive and convincing, with the consultancy having its own sustainability roadmap and a stated intention to go beyond the 'business as usual' agenda. Importantly, the consultancy also encourages its clients to exceed standard practice on sustainability.

Sponsored by ABB



Dr Sarah Prichard was guest speaker at the awards



Collaborative Working Partnership

Winner: Broadway Chambers - Woodford Heating and Energy

This entry stood out for the judges because of the very clear and considered thought process behind the collaboration. The contractor team was chosen to match the client team in terms of personality and seniority. The judges said the project showed the success of considering personality traits and management styles to create the best team possible.

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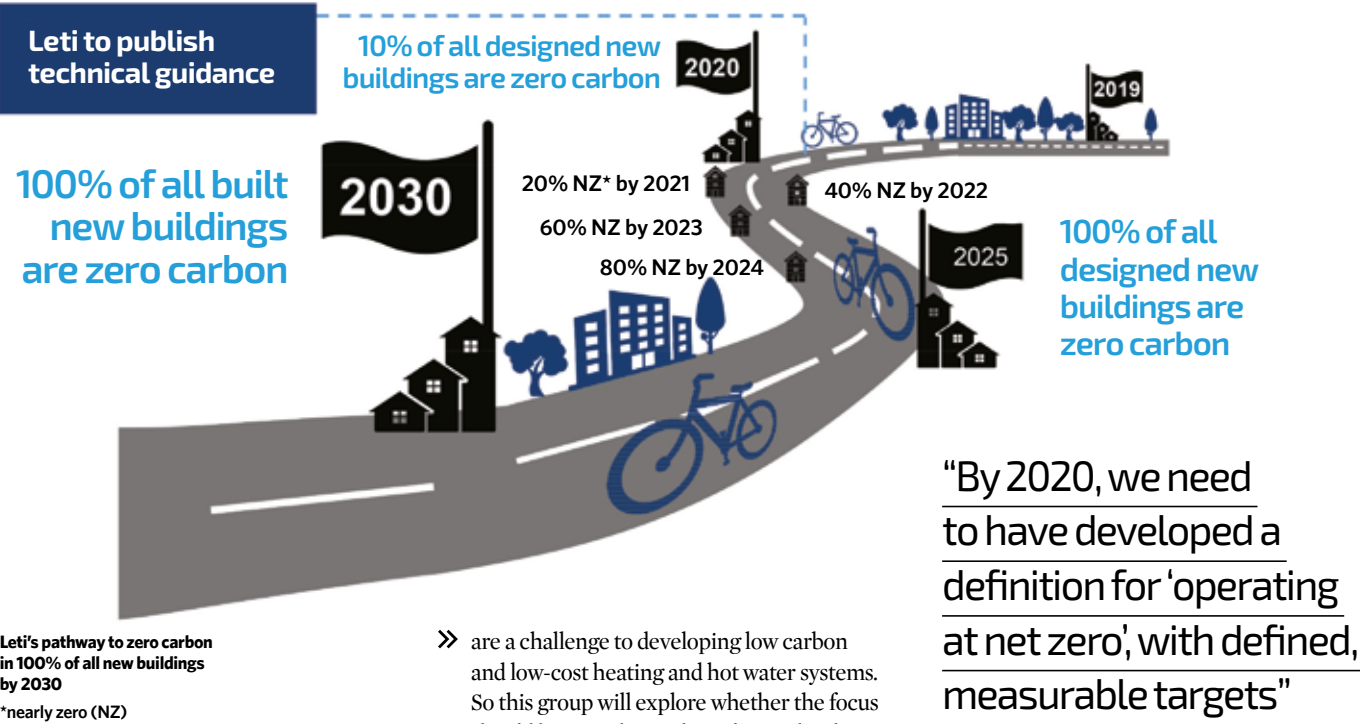
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H - 505mm
D - 353mm

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Demand response and energy storage (DRES)
This will establish whether flexibility in when buildings and occupants use energy

“By 2020, we need to have developed a definition for ‘operating at net zero’, with defined, measurable targets”

can reduce carbon emissions. The focus will be on developing guidance on how DRES can reduce the carbon footprint of buildings, and how local authorities can assess whether a building has been designed to maximise energy-use flexibility.
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Leti Declaration
To achieve the Leti goals, it is crucial that industry leads by example and builds upon the changes in the draft London Plan to deliver operational net zero carbon buildings. The Leti Declaration tool has been developed to help achieve this, with a strong focus on nudging design teams to think about how their design proposals would perform in operation.
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Cost model

Battery storage

Advances in battery technology and steep falls in prices for PVs and storage is making smart energy grids an attractive commercial proposition. Aecom's first cost model of the year assesses the viability of batteries across a number of scenarios

The advance in battery storage technology means the role it can play in developing a smarter energy system is becoming a commercial reality. Lithium-ion batteries have fallen in price, so storage has become an increasingly attractive method of reducing energy bills and dependence on the National Grid. Coupled with a dramatic fall in the price of solar photovoltaic (PV) cells, there is a promising business case to be made for the large-scale employment of both technologies in the domestic and commercial market.

State of the market

Since 2010, there have been more than 700,000 domestic solar PV installations in the UK, resulting in a solar PV capacity of 9GW – representing a huge opportunity for battery storage to harness this energy. In the



same period, there has been a significant fall in the price of lithium-ion battery storage, from £770/kWh to £180/kWh. This is plateauing, however, and Tesla and Panasonic have recently revised their prices upwards by 12% for their domestic and small business Powerwall product. Despite this, when the relative warranties and efficiency degradation rates are taken into account, products such as Tesla's offer a cost-effective solution to a consumer with sufficient load demands.

While the rest of the domestic battery-storage market catches up with the demand created, the market is not necessarily moving in the right direction. If battery storage is to be employed effectively in communities – which contain a mix of residential, retail and commercial space with varying loads – it needs to be done in partnership with the distribution network operator (DNO).

A great example is Project SCENe's Trent Basin development, which is home to Europe's largest community battery-storage system, with a capacity of 2.1MWh. Sized to be future-proof, this system aggregates demand and supply, thereby offering a far more efficient use of energy while generating a revenue stream through a firm frequency response (FFR) contract signed with the National Grid.

This concept of community energy storage gets particularly exciting when combined, potentially, with electric vehicles (EVs). Researchers and the industry are now grappling with the challenge of integrating EVs into community battery-storage systems with two-way charging points, which would allow energy to be pooled between building demands and the connected vehicles (naturally, stationary for 95% of the time). In the near future, we could see EV owners being paid when they connect to the Grid and agree to controlled charging.

The business case

Electricity consumption can be a significant cost to a commercial or industrial consumer. Battery storage represents an opportunity to not only reduce this, but also generate a return on the investment. Judging the business case for investing in battery-storage systems requires an

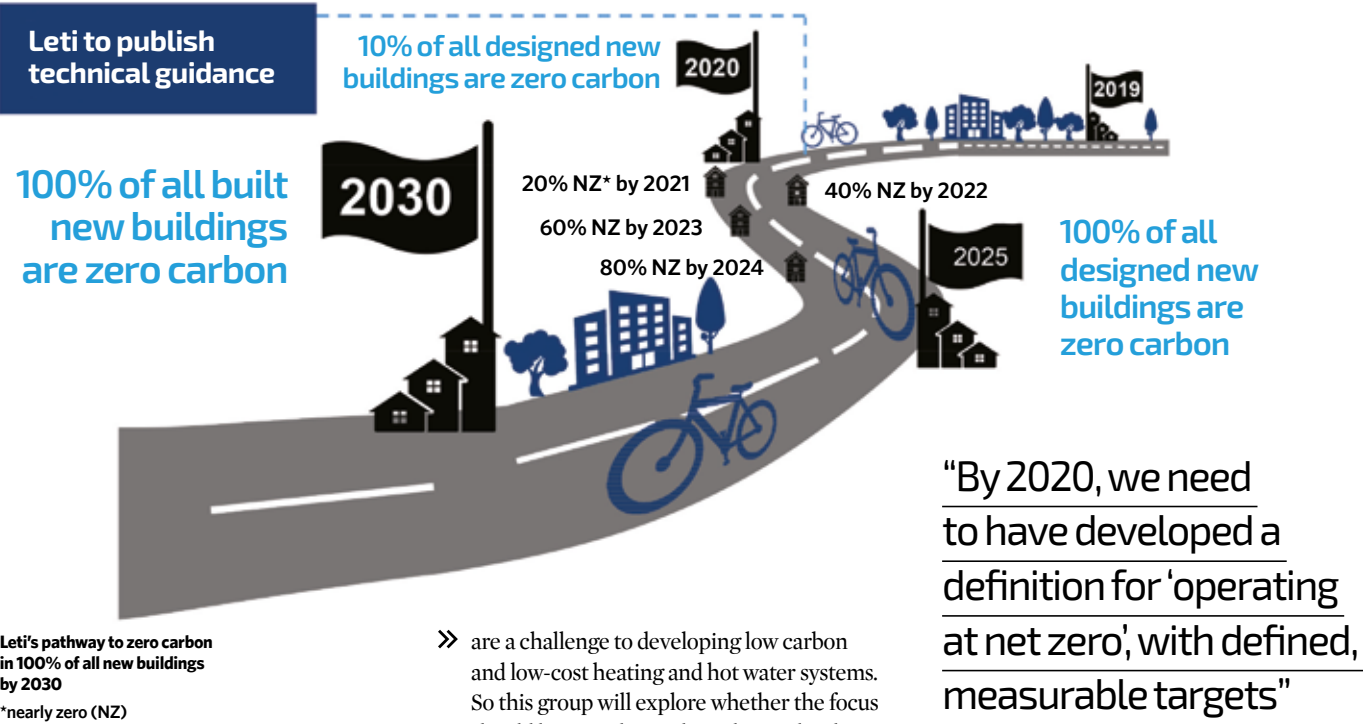
understanding of the relevant agreements in place with the Grid that ensure revenue streams back to the operator.

The initial capital investment made in a battery-storage system includes not only the battery, but the connection costs associated with the DNO, the necessary inverter, transformer, switchgear and contract formation. While there is sizeable initial capital expenditure (capex), the operator has to consider the coinciding operating



Cost data: battery storage, three scenarios: TNUoS/DUoS income and FFR and Econ 7	Base position				Base position + five years FFR				Base position + five years FFR + Economy 7			
	Year 2019	Year 2020-28	Year 2029-38	Year 2039-48	Year 2019	Year 2020-28	Year 2029-38	Year 2039-48	Year 2019	Year 2020-28	Year 2029-38	Year 2039-48
	1	2-10	11-20	21-30	1	2-10	11-20	21-30	1	2-10	11-20	21-30
Capital expenditure (capex)												
Estimated installation of 1.8MW system	900,000				900,000				900,000			
DNO network connection costs	45,000				45,000				45,000			
LV inverter/transformer/switchgear	60,000				60,000				60,000			
Contract formation	40,000				40,000				40,000			
Operational expenditure (opex)												
Annual maintenance		27,300	44,000	65,200		27,300	44,000	65,200		28,600	46,200	68,300
Replacement cycle			1,320,900	684,900			1,320,900	684,900			1,320,900	684,900
Additional insurance premiums		86,100	110,200	127,900		86,100	110,200	127,900		109,519	110,200	127,900
Physical maintenance		500	5,800	7,400		4,000	6,200	7,900		7,500	10,500	13,500
Net cash outflows	1,045,000	113,900	1,480,900	885,400	1,045,000	117,400	1,481,300	885,900	1,045,000	122,200	1,487,800	894,600
Income												
TNUoS		618,100	1,144,700	1,955,300		618,100	1,144,700	1,955,300		618,100	1,144,700	1,955,300
DUoS		240,100	444,600	759,300		240,100	444,600	759,300		240,100	444,600	759,300
FFR						282,900	0	0		282,900	0	0
Capacity market levy		49,000	68,800	88,000		49,000	68,800	88,000		49,000	68,800	88,000
Economy 7 opportunity										145,900	271,400	463,500
		907,200	1,658,000	2,802,600		1,190,100	1,658,100	2,802,600		1,336,000	1,929,500	3,266,100
Assumed average efficiency (fluctuates due to replacement cycle)		89%	81%	72%		89%	81%	72%		89%	81%	72%
Net cash inflows (after efficiency is accounted for)	0	795,800	1,342,100	1,999,500	0	1,065,800	1,342,100	1,999,500	0	1,179,900	1,560,600	2,330,100
Net cash flows	-1,045,000	681,900	-138,800	1,114,100	-1,045,000	948,400	-139,200	1,113,600	-1,045,000	1,057,700	73,000	1,435,700
Present value of income	834,885				1,058,502				1,378,918			
Initial capital cost	-1,045,000				-1,045,000				-1,045,000			
Net present value	-210,115				13,502				333,918			
Percentage value of return on investment	-20%				1%				32%			

Figure 1: Inflows and outflows calculated against an initial investment in three scenarios, and the final return generated



Leti's pathway to zero carbon in 100% of all new buildings by 2030

*nearly zero (NZ)

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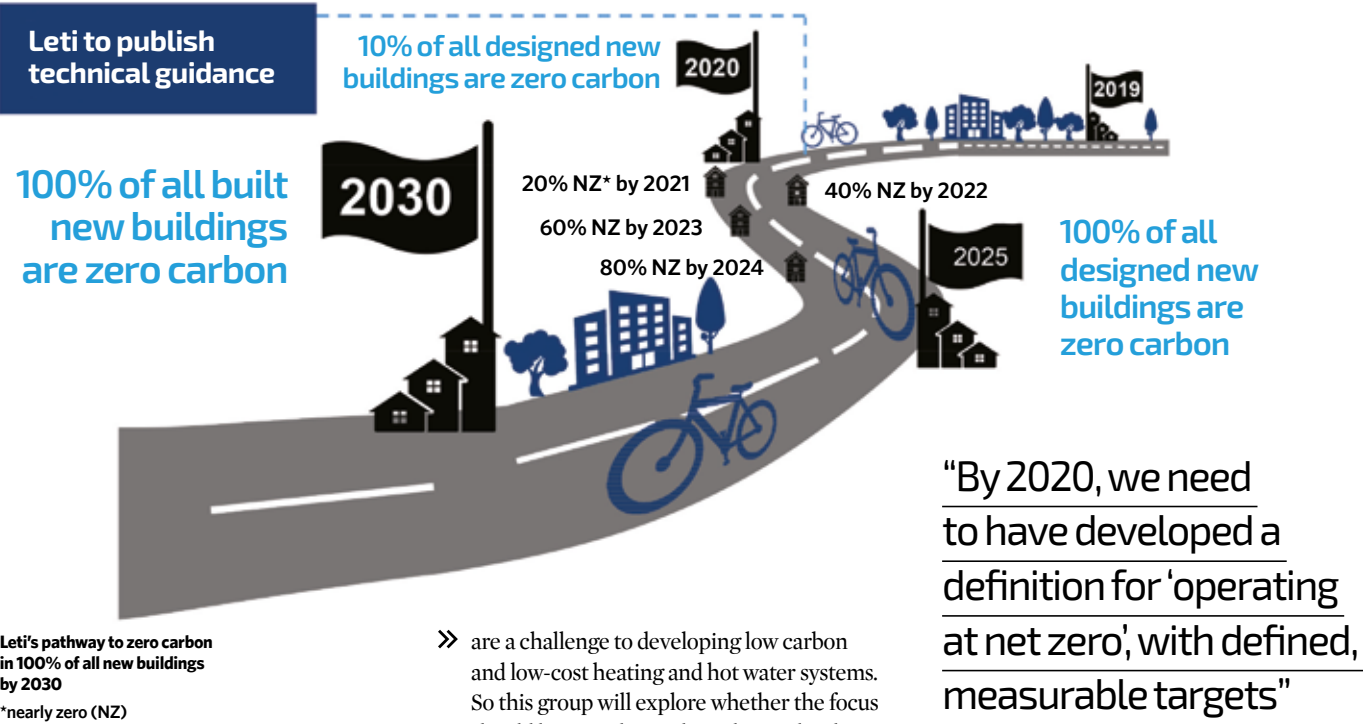
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Economy 7 opportunity										145,900	271,400	463,500
		907,200	1,658,000	2,802,600		1,190,100	1,658,100	2,802,600		1,336,000	1,929,500	3,266,100
Assumed average efficiency (fluctuates due to replacement cycle)		89%	81%	72%		89%	81%	72%		89%	81%	72%
Net cash inflows (after efficiency is accounted for)	0	795,800	1,342,100	1,999,500	0	1,065,800	1,342,100	1,999,500	0	1,179,900	1,560,600	2,330,100
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If not now, when?”
– JFK

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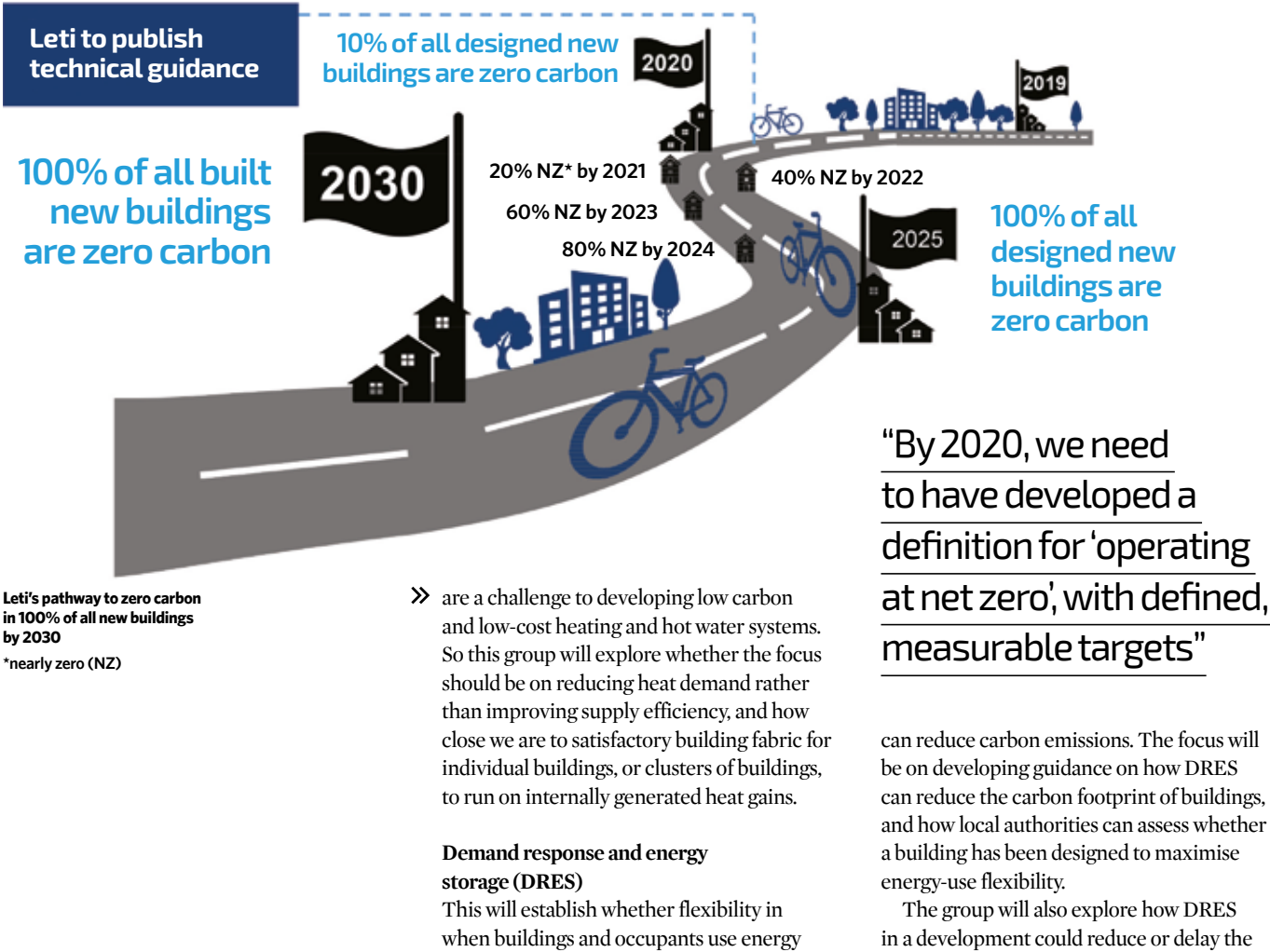
understanding of the relevant agreements in place with the Grid that ensure revenue streams back to the operator.

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Cost data: battery storage, three scenarios: TNUoS/DUoS income and FFR and Econ 7	Base position				Base position + five years FFR				Base position + five years FFR + Economy 7			
	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
	2019	2020-28	2029-38	2039-48	2019	2020-28	2029-38	2039-48	2019	2020-28	2029-38	2039-48
	1	2-10	11-20	21-30	1	2-10	11-20	21-30	1	2-10	11-20	21-30
Capital expenditure (capex)												
Estimated installation of 1.8MW system	900,000				900,000				900,000			
DNO network connection costs	45,000				45,000				45,000			
LV inverter/transformer/switchgear	60,000				60,000				60,000			
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Additional insurance premiums		86,100	110,200	127,900		86,100	110,200	127,900		109,519	110,200	127,900
Physical maintenance		500	5,800	7,400		4,000	6,200	7,900		7,500	10,500	13,500
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**Building Performance Consultancy
(up to 100 employees)**

Winner: WARM: Low Energy Building Practice

Practising what it preaches, building performance consultancy WARM refurbished its offices to the Passivhaus standard. WARM wants to make this level of building performance and quality the standard in the UK, and the judges acknowledged how the consultancy is seeking to develop Passivhaus with the supply chain in an innovative way that is more likely to deliver longer-term impact.

Sponsored by Panasonic



**Building Performance Consultancy
(over 1,000 employees)**

Winner: BuroHappold Engineering

The judges commended the group's commitment to addressing building performance and ensuring that understanding is reflected in what is delivered on site. They acknowledged how BuroHappold is engaging with the key topics of healthy, safe buildings, and delivering ones that are resilient to a changing climate and that have less negative impact on the environment in the future.

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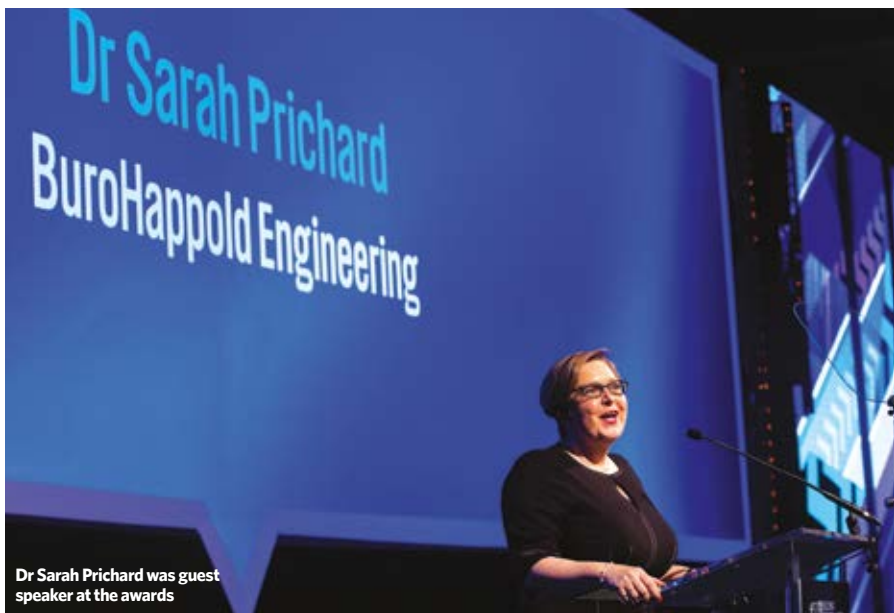


**Building Performance Consultancy
(101-1,000 employees)**

Winner: Cundall

The judges described Cundall's submission as comprehensive and convincing, with the consultancy having its own sustainability roadmap and a stated intention to go beyond the 'business as usual' agenda. Importantly, the consultancy also encourages its clients to exceed standard practice on sustainability.

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Dr Sarah Prichard was guest speaker at the awards



Collaborative Working Partnership

Winner: Broadway Chambers - Woodford Heating and Energy

This entry stood out for the judges because of the very clear and considered thought process behind the collaboration. The contractor team was chosen to match the client team in terms of personality and seniority. The judges said the project showed the success of considering personality traits and management styles to create the best team possible.

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MAX OUTPUT

MIN SIZE

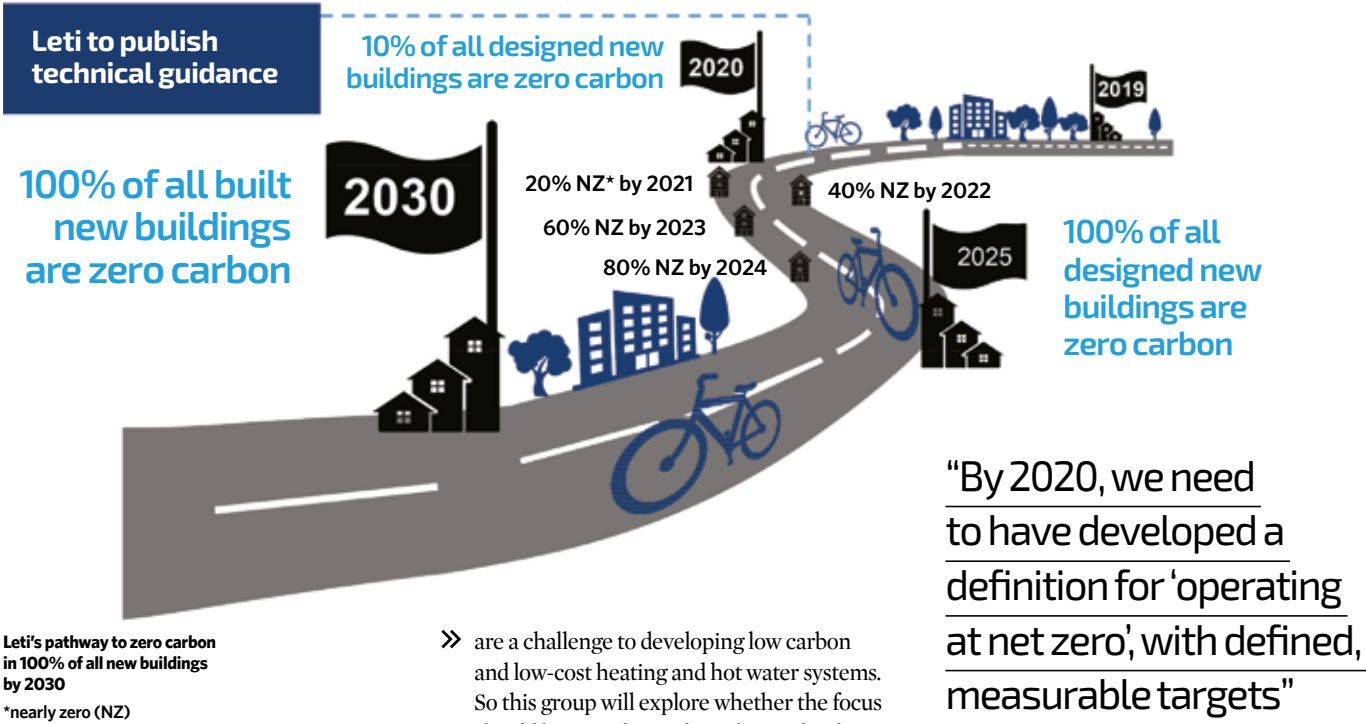
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H - 505mm
D - 353mm

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Leti's pathway to zero carbon in 100% of all new buildings by 2030

*nearly zero (NZ)

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Lithium-ion battery storage in a residential setting



An example of commercial lithium-ion battery storage

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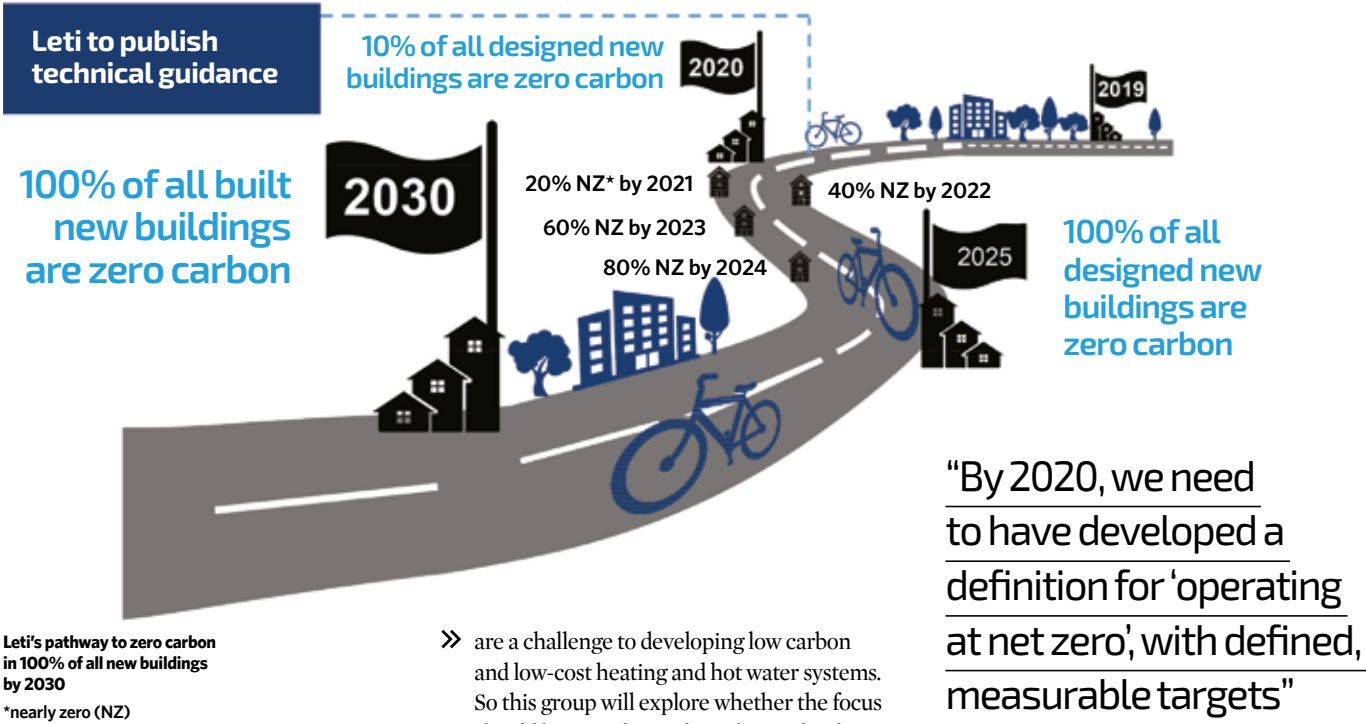
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Cost model

Battery storage

Advances in battery technology and steep falls in prices for PVs and storage is making smart energy grids an attractive commercial proposition. Aecom's first cost model of the year assesses the viability of batteries across a number of scenarios

The advance in battery storage technology means the role it can play in developing a smarter energy system is becoming a commercial reality. Lithium-ion batteries have fallen in price, so storage has become an increasingly attractive method of reducing energy bills and dependence on the National Grid. Coupled with a dramatic fall in the price of solar photovoltaic (PV) cells, there is a promising business case to be made for the large-scale employment of both technologies in the domestic and commercial market.

State of the market

Since 2010, there have been more than 700,000 domestic solar PV installations in the UK, resulting in a solar PV capacity of 9GW – representing a huge opportunity for battery storage to harness this energy. In the



same period, there has been a significant fall in the price of lithium-ion battery storage, from £770/kWh to £180/kWh. This is plateauing, however, and Tesla and Panasonic have recently revised their prices upwards by 12% for their domestic and small business Powerwall product. Despite this, when the relative warranties and efficiency degradation rates are taken into account, products such as Tesla's offer a cost-effective solution to a consumer with sufficient load demands.

While the rest of the domestic battery-storage market catches up with the demand created, the market is not necessarily moving in the right direction. If battery storage is to be employed effectively in communities – which contain a mix of residential, retail and commercial space with varying loads – it needs to be done in partnership with the distribution network operator (DNO).

A great example is Project SCENe's Trent Basin development, which is home to Europe's largest community battery-storage system, with a capacity of 2.1MWh. Sized to be future-proof, this system aggregates demand and supply, thereby offering a far more efficient use of energy while generating a revenue stream through a firm frequency response (FFR) contract signed with the National Grid.

This concept of community energy storage gets particularly exciting when combined, potentially, with electric vehicles (EVs). Researchers and the industry are now grappling with the challenge of integrating EVs into community battery-storage systems with two-way charging points, which would allow energy to be pooled between building demands and the connected vehicles (naturally, stationary for 95% of the time). In the near future, we could see EV owners being paid when they connect to the Grid and agree to controlled charging.

The business case

Electricity consumption can be a significant cost to a commercial or industrial consumer. Battery storage represents an opportunity to not only reduce this, but also generate a return on the investment. Judging the business case for investing in battery-storage systems requires an

LETI AND ITS IMPACT

Leti was established to support the transition of London's buildings to net zero carbon. Its focus was initially to influence energy policy in London, including the draft London Plan and the London Environment Strategy. Although still working with the GLA, Leti's focus has shifted to offering solutions and approaches to support the zero carbon transition. Many of its recommendations have been included in emerging London policy and energy assessment guidance:

Energy-use disclosure: A 'be seen' stage has been added to the energy hierarchy that cements monitoring, verifying and reporting into the London Plan.

Carbon factors: The draft London Plan recognises that Building Regulations use outdated carbon-emission factors. The GLA energy assessment guidance recommends that SAP10 carbon factors (for example, 233gCO₂/kWh for electricity) are used from January 2019.

Whole life-cycle carbon: Referable schemes to calculate whole life-cycle carbon emissions through a nationally recognised assessment, and to demonstrate actions taken to reduce life-cycle carbon.

Enhanced fabric and systems: A 10% reduction in carbon emissions for residential development, and a 15% reduction for non-residential, to be achieved by using efficient building fabric and systems.

Increased transparency of design: Reporting on total energy demand and glazing ratio. Fabric Energy Efficiency Standard (FEES) to be reported for residential.

Overheating: CIBSE TM52 or TM59 criteria are met using the DSY1 (2020's 50th percentile) weather file, and that sensitivity analysis is carried out for DSY2 and DSY3 (2020's 50th percentile). An overheating checklist must be completed for residential developments.

Future-proofed to achieve zero carbon onsite: All developments and district heating systems to be future-proofed to achieve zero carbon onsite by 2050.

Calculation of unregulated energy consumption: Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations.

Cost to occupant: To be reported if heating and hot water are to be provided by heat pumps.

Onsite renewable: To be maximised, regardless of whether 35% carbon-emission reduction has been met.

Demand-side response: Plans for demand-side response and investigations into energy storage are required.

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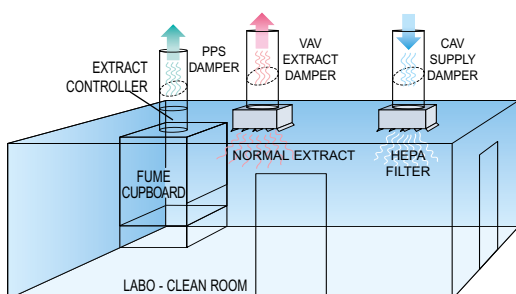


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